

## EFFECTS OF TUMBLING PROCESS ON PHYSICOCHEMICAL PROPERTIES OF OCTOPUS (*OCTOPUS VULGARIS*)

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### EFEKTI TUMBANJA NA FIZIČKE I HEMIJSKE ODLIKE HOBOTNICE (*OCTOPUS VULGARIS*)

#### *Apstrakt*

Hobotnica (*Octopus vulgaris*) je glavonožac koji se konzumira pretežno na Mediteranu, u Južnoj Africi i Istočnim zemljama sveta. Najčešće se plasira na tržište sveža, zaleđena ili suva usoljena. U načelu, sveži glavonošci, a naročito hobotnica, imaju veoma čvrstu i žilavu strukturu. Ova čvrstina potiče iz strukture i sastava kolagena, i njegovog nakupljanja u mišićima glavonožaca. Kod hobotnice, kolagen se najčešće opušta u vrućoj, najčešće ključaloj vodi. Tradicionalan način ublažavanja čvrstine kod hobotnice bio je 'mlaćenje' sveže ulovljene hobotnice o stene pored mora. Industrija je usvojila ovu proceduru, tako da se mehanično 'mlaćenje' primenjuje u specijalizovanoj opremi za tumbanje, gde se hobotnica tumba u vodi. Proces tumbanja se često koristi da se poremeti struktura mišića, razgrade spoljne površine komada mesa i otpuste protein iz miofibrila. Tumbanje poboljšava nežniju strukturu hobotnice dok NaCl (u niskim koncentracijama) pomaže izlučivanje proteina i poboljšava kapacitet mišića za zadržavanjem vode i na taj način povećava nežnost krajnjeg proizvoda. Proces tumbanja ispitivan je za omekšavanje drugih vrsta mesa. Međutim, postoji ograničen broj studija koje se bave upotrebom tumbanja na hobotnice.

Osnovni cilj ovog istraživanja jeste da ispita efekte koje process tumbanja ima na fizičko-hemijske odlike mišića hobotnice. Hobotnica (*Octopus vulgaris*) sa glavne pijace ribe u Antaliji. Odmah pošto je dospela na kopno, hobotnica je kupljena i stavljena u hladne kese za skladištenje sa ledom. Proces tumbanja izvršen je korišćenjem mašine za tumbanje koja je posebno dizajnirana za ovu studiju. Proces tumbanja izvršen je u kontinuitetu, sa 3 različite dužine trajanja procesa (2, 4, 6 sati). Posle tumbanja, uzorci su podvrgnuti analizi. Rezultati su pokazali da je tumbanje imalo pozitivan efekat na fizičko-hemijske odlike hobotnice. Dužina trajanja tumbanja uticala je na sve parametre. Sa povećanjem

trajanje tumbanja, povećavala se i nežnost mišića hobotnice. Ukupna količina rastvorljivog proteina, ukupna količina amino kiselina i pH vrednosti su se povećale sa povećanjem trajanja tumbanja. Kapacitet za zadržavanjem vode se smanjio a gubitak pri kuvanju povećao. Prema merenjima teksture instrumentima, čvrstina i vrednosti poprečne sile su se smanjile posle procesa tumbanja. Zaključeno je da je process tumbanja efikasan metod za opuštanje mišića hobotnice.

*Gljučne reči: Hobotnica, omekšavanje, tumbanje, tekstura*

#### *Abstract*

Common octopus (*Octopus vulgaris*) is a cephalopod eaten mainly in Mediterranean, South American and Oriental countries and is typically marketed fresh, frozen and dried salted. Cephalopods in general and octopus in particular have a very firm and tough texture, especially when fresh. This toughness is associated with the collagen structure, content and aggregation in the cephalopod muscles. Collagen in octopus is tenderized mainly by heating, usually in boiling water. The traditional way to overcome octopus toughness has been the repeated "beating" of the freshly caught octopus on the rocks by the sea. This procedure has been adopted by the industry the mechanical "beating" of octopus is performed in specialized tumbling equipment, where octopus is tumbled in water. Tumbling processes are commonly used to disrupt the muscle structure, disintegrate external surfaces of meat pieces and to release myofibrillar proteins. In general, tumbling improves tenderness while NaCl (in low concentrations) helps the extraction of proteins and improves the water-holding capacity of the muscle increasing the tenderness of the final product. Tumbling process has been studied for other meats for tenderization. However there is in limited amount of study on use of tumbling on octopus.

The main objective of this study is to investigate the effects of tumbling process on physicochemical properties of octopus muscle. Octopus (*Octopus vulgaris*) was obtained from the main fish market of Antalya. They were purchased just after landing and placed in cold storage bag with ice. Tumbling process was carried out using a tumbler specially designed for this study. Tumbling process was performed continuously in 3 different tumbling times (2, 4, 6 h). After tumbling, the samples were analysed. According to results tumbling was effective on physicochemical properties of octopus. Tumbling time affected all parameters. With increase in tumbling time increased in tenderness of octopus muscle. Total soluble protein, total free amino acid and pH values increased with increase of tumbling time. Water holding capacity decreased and cooking loss increased. According to instrumental texture measurements, hardness and shear force values decreased after tumbling process. As a result, tumbling was found as effective method to tenderize of octopus muscle.

*Keywords: Octopus; tenderization; tumbling; texture*